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STUBBLE *Saves* THE SOIL

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SOIL MANAGEMENT

Soil conservation is but a part of a complete program of soil management. Too often soil conservation is considered to be mainly saving soil for the future. The best practices for soil conservation pay not only in saving for the future but providing profitable returns now.

Prairie soils have been farmed a short time in comparison to older agricultural lands. The ravages of erosion are not severe enough to cause concern to most farmers. There are a growing number of farms, however, where soil drifting, water erosion and careless tillage are resulting in lowered yields and tillage problems.

Soil erosion is a constant menace where soil is exposed to wind or water. Protection and prevention are the watchwords of soil conservation and erosion control. Trash cover is one of the most valuable tools in the development of sound soil management practices for Saskatchewan farms.

Cover Photo by A. Sinclair, North American Cyanimide Company.

Stubble Saves The Soil

A good surface cover is the best way to keep soil from drifting or washing. In Saskatchewan where straight grain growing is the main system of farming, the only cover on the soil is the straw and stubble from last year's crop. We need to use all this stubble and straw to help prevent wind and water erosion and to keep our soils productive .

Grasses and grass-legume mixtures are the best crops to prevent soil erosion on sandy land or steep slopes. In the more humid areas of eastern and northern Saskatchewan grasses and legumes should be used in rotations and in the drier parts of the southwest, sandy soils which drift easily should be seeded permanently to grass.

Trees are valuable aids in controlling wind erosion. Field shelterbelts should be used in many areas where soil drifting is a serious menace. Forest cover gives good protection against both wind and water. In northern Saskatchewan land which is not suited for farming should be left in forest or woodlot.

Regardless of how we use trees and grass, we must depend on trash cover to protect our cultivated soil. Stubble and straw help to prevent erosion caused by water runoff and soil drifting on summerfallow fields. By careful tillage methods we can keep trash cover at the surface to hold the top soil in place and keep it in good tilth. STUBBLE SHOULD NOT BE BURNED.

Topsoil

The topsoil is the most valuable part of our land. It contains much more plant food than the subsoil, is easier to work and generally grows better crops. The poor crops growing on "borrow pits" along the highway and on eroded knolls show how difficult it is to grow good crops on subsoil.

The average topsoil in Saskatchewan is less than six inches deep. We can not afford to lose any of that precious six inches. If we lose one inch of topsoil from one acre, we lose plant food worth $200 if it were bought as commercial fertilizer.

When soil drifts or washes the best part of the topsoil, the particles of fine clay and organic matter, goes first. Drift soil or silt from water erosion contains two to five times as much nitrogen and phosphorus as the average surface soil. The soil left behind is coarser, holds less water, drifts or washes more easily and is not as productive.

The Good Dark Topsoil is only a few inches deep.

Erosion Reduces Yields

We may think that soil drifting and water erosion have not lowered yields very much. In southeastern Saskatchewan a drifted field yielded 8 bushels of wheat per acre in 1952, even though grown on summerfallow with 40 pounds per acre of 11-48-0 fertilizer. The average yield in this same area on non-eroded fields was over 30 bushels per acre. The Lethbridge Experimental Station obtained a yield of 12 bushels per acre on eroded land in 1953 compared to 30 bushels per acre on non-eroded land.

—Photo: H. M. Holm.

This drifted field yielded less than 8 bushels per acre in 1952.

The Saskatchewan Assessment Commission checked crop yields on fields with varying depths of topsoil over a four year period. Where there was over six inches of topsoil the average yield was 24 bushels per acre—but where it was less than 3 inches deep the average yield was only 11 bushels per acre.

We can not afford to lose top soil. Trash cover helps to save it. Subsoil may grow a crop but it will seldom be a profitable crop. It is cheaper and easier to keep the topsoil we have than to build a new topsoil from subsoil.

Water Erosion starts on Black Summerfallow.

Organic Matter

Organic matter is the key to productive soils and good crops. Whether we call it fibre, humus or decaying plant and animal material, organic matter is the difference between soil and dead earth. Organic matter contains most of the nitrogen in the soil, gives the soil good tilth and allows it to take and hold moisture better.

Soils low in organic matter puddle when wet and bake hard when dry. Rainfall quickly seals the surface of such soils and water runs off. Soil without enough organic matter is cold, hard, difficult to work and subject to erosion.

Stubble, straw and roots are the only sources of organic matter in straight grain farming. While roots supply a limited amount of organic matter, the stubble and straw are most important. Stubble should never be wasted by burning. When stubble is burned there is a loss of two dollars per acre in nitrogen alone—but the organic matter and surface cover lost is worth a great deal more.

Handling Straw and Stubble

Stubble mulch farming requires careful planning. Moisture, disease and insect control, amount of straw, and fertility must be kept in mind when planning tillage and cropping practices. After good crop years, heavy straw is often a problem and we must plan to have tillage and seeding machinery operate efficiently in the heavy trash. After poor crop years, we must plan to keep as much stubble and straw at the surface as possible.

Preparation for handling stubble and straw begins at harvest time. Straw must be spread evenly over the field, especially if a stubble crop is to be grown the next year. Long stubble should be left to hold snow on the fields and thus increase the moisture supply. It is easier to cultivate through long stubble than through a heavy layer of straw.

When the weather is dry, a good straw spreader will spread the straw from a normal crop. For heavy crops, a straw cutter on the combine should be considered. Some straw cutters cut the straw fairly well without reducing the efficiency of the combine. Even though a straw cutter is used it is important to spread the straw. Use of a forage crop harvester to pick up and chop the windrows is another possibility.

Cultivation of stubble land with a heavy straw cover is done best when the soil and trash are dry. If the straw is wet, it does not break up well and plugs the machinery.

The oscillating harrow is a useful implement for spreading swaths and does a good job on soils other than

—Photo: Regina Experimental Sub-Station.
Blade cultivator operates through heavy trash.

heavy clays. It works best under dry conditions. After straw has been broken up and well spread, cultivators and disc implements in good shape can be used satisfactorily. Cultivators must have good clearance, discs must be sharp and all machines must be properly adjusted.

—Photo: Regina Experimental Sub-Station.
Cultivating through a heavy trash.

Seeding Stubble Land

Cultivation of stubble land for seeding should keep the straw and stubble close to the surface. Straw and stubble buried in the soil cause a loose open seed bed. Fertility problems, due to bacterial competition for nitrogen and phosphorus, are greater when straw is worked into the soil.

Where wild oats are not a problem, stubble land can be seeded in one operation with the one-way or discer. Packing after seeding is very important to get good germination and an even stand.

Fall cultivation for weed control should be shallow and in most cases should be done with sub-surface cultivators. Disc implements should not be used for fall cultivation of stubble unless needed to reduce trash for spring seeding. If straw has been well spread, cultivators or disc implements are suitable for tillage before seeding. Pre-seeding tillage should not be any deeper than necessary to control weeds.

Fertilizer For Stubble Crops

Heavy crops of stubble worked into the soil may cause a temporary shortage of plant food for stubble crops. Bacteria rotting the straw compete with the growing crops for nitrogen and phosphorus. Preliminary experimental work shows that this effect is not so bad where the trash is kept at or near the surface.

Phosphate fertilizers containing a good supply of nitrogen have given profitable returns on stubble crops in the moister areas of the province. Where much stubble and straw is worked into the soil, ammonium phosphate 16-20-0 at 75 to 100 pounds per acre should be used. Where trash is kept close to the surface and a good seeding job is done, ammonium phosphate 11-48-0 at 40 to 60 pounds per acre has given profitable yield increases in the Black Soil Zone.

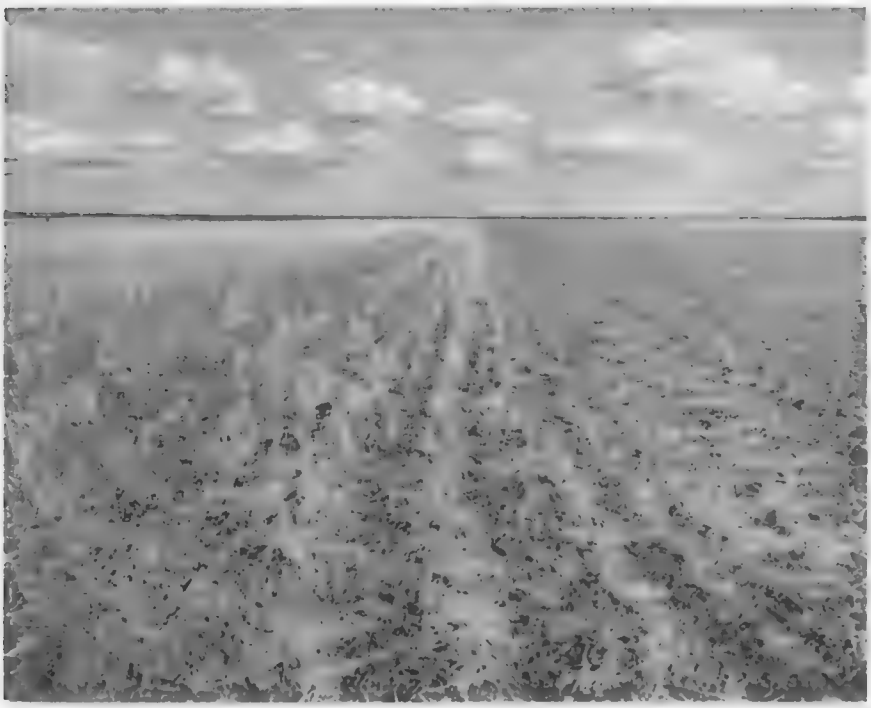
Nitrogen fertilizers, 33-0-0 ammonium nitrate and 21-0-0 ammonium sulphate at 45 to 60 pounds per acre have given some yield increases on stubble crops. Straight nitrogen fertilizers should be used on a trial basis only. Fall application of nitrogen fertilizers to speed up the rotting of straw and stubble has not proven satisfactory in Saskatchewan as temperatures are usually too low after application to allow much decomposition in the fall.

The beneficial effect of legumes in maintaining satisfactory yields of stubble crops has been observed, partic-

ularly on the black, greyish-black and grey soils. Alfalfa or sweet clover in the rotation may be the most economical way of correcting nitrogen deficiencies and the problems of stubble management. Legumes improve nitrogen supply, crop residues decay more rapidly and better tilth makes seed bed preparation easier.

Summerfallow

In the drier areas of the province, fall cultivation of stubble is not recommended as a general practice. If the stubble is left standing over winter, it will hold snow and help to increase the moisture supply. If fall cultivation is needed for weed control, cultivator type implements should be used as they will leave the stubble standing better than disc type machines.



—Photo: Regina Experimental Sub-Station.

Stubble on left was worked with a cultivator, that on right with a one way disc. The cultivator leaves a much better trash cover.

Experiments at the Lethbridge Experimental Station have shown that blade cultivators leave 70% of the trash on the surface after four operations, while other cultivators leave 60 to 70% of the trash on the surface after two operations. After three operations with a one way or discer only 10 to 20% of the trash was left on top. The results show that cultivator type implements should be used to keep a good trash cover.

The heavy duty cultivator can be used for the first operation in the spring. Where three or four operations are enough to control weeds and there is a good trash cover, later operations can be done with the one way or discer. The first operation with the cultivator should be deep enough to establish the tillage depth for the season. If the first operation is done with a disc type implement, it should be shallow enough to allow later cultivation with the cultivator to be done in firm soil. If disc implements are set too deep in the first operation cultivators may tend to plug during the later operations. The important factor in keeping a good trash cover is to reduce the number of operations with disc type implements.

Disc type machines should be operated at moderate speeds. At high speeds, dry soil is easily pulverized and may drift. When the soil is moist, a little higher speed can be used without pulverizing the soil and the effect on trash cover is little different. The best guide to speed is careful examination of the condition of soil and trash cover behind the tillage implement.

The rod weeder is a valuable supplementary implement. Care should be taken not to throw trash loosely on the surface by operating the rod weeder too close to the surface in the fall. Trash should be anchored by using a cultivator for the last operation. The drag harrow should be used with care on summerfallow. Frequent harrowing causes excessive pulverization and leads to serious drifting and washing.

For Good Soil Management

DO

- MAINTAIN TRASH COVER
- PRACTICE STRIP CROPPING
- USE GRASSES AND LEGUMES
- SEED WATERWAYS TO GRASS
- USE FERTILIZER WHERE RECOMMENDED
- PLANT FIELD SHELTERBELTS

DO NOT

- ★ BURN STUBBLE
- ★ WASTE BARNYARD MANURE
- ★ PULVERIZE TOO FINELY
- ★ CULTIVATE NATURAL WATERWAYS
- ★ BURY ALL TRASH
- ★ OPERATE DISC IMPLEMENTS AT HIGH SPEEDS

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PREPARED BY:

W. E. JOHNSON,
Soil Conservation Representative,
Plant Industry Branch,
Saskatchewan Department of Agriculture.

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